

EAST BAY MUNICIPAL UTILITY DISTRICT

BOARD WORKSHOP #4

- Reclamation
- Conservation
- Drinking Water Quality

Updated Water Supply Management Program

July 20, 1991

Prepared By
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for
East Bay Municipal Utility District

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ACWD OPERATIONS
EBMUD BDCT

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~~EBMUD UPDATED WEMP EXS/FIR~~
WATER QUALITY

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D-043943

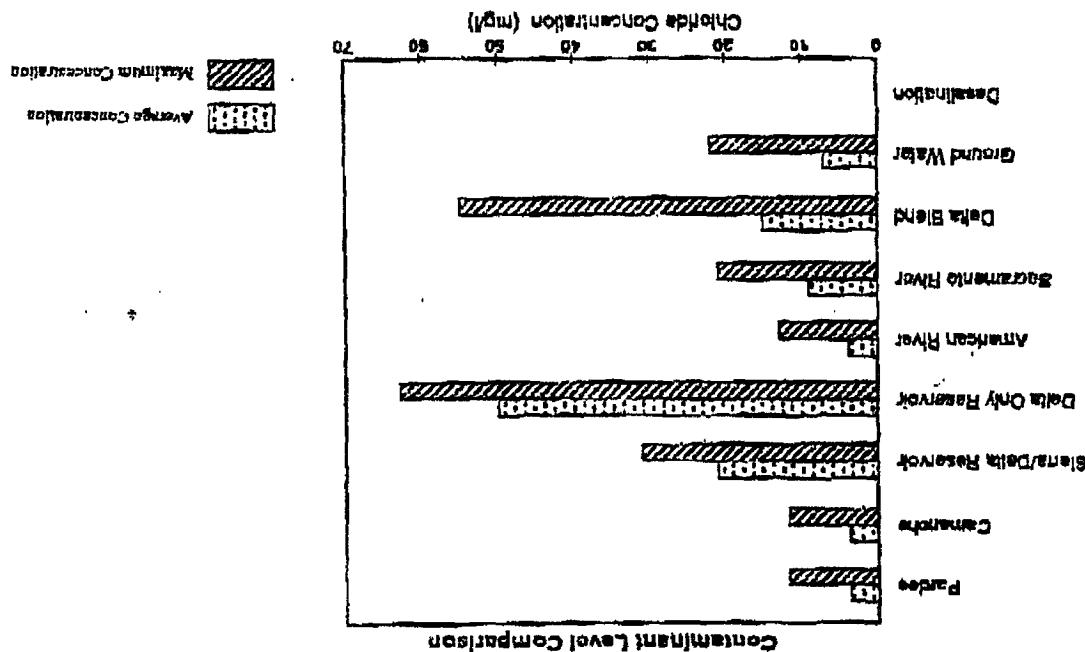
EBMUD UPDATED WSMP EIS/RIR
WATER QUALITY

- The EPA considers drinking water pollution to be 1 of the 4 greatest environmental risks facing the public today. (Reducing Risk: Setting Priorities and Strategies For Environmental Protection, EPA, 1990)
- Regulated primary contaminants have increased from 22 in 1976 to 62 in 1991. Expected to increase to 83 by approximately 1995.
- EBMUD does have choices.
- Choices represent different contaminant levels and associated health implications.
- This is a comparative analysis of alternative drinking water sources, with different treatment technologies.
- This is not a supplemental supply analysis.
- Risk is analyzed in relative not absolute terms.
- All sources can be treated by optimizing technology, at an increased cost and a reduction in system flexibility.

WEDNESDAY, DECEMBER 18, 1991

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(1) Daka is Arranged with Focussed or Linear
 (2) There is No Significant Change After Treatment
 (3) There is Some Improvement Before Treatment
 (4) There is No Improvement Before Treatment

(5) Daka is Arranged with Focussed or Linear
 (6) There is Some Improvement Before Treatment
 (7) There is No Improvement Before Treatment
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 (25) There is No Improvement Before Treatment

Alternatives Source Water Quality Analyses:
Betro Treatment
(Assumes Years: 1983-1990) (1)
(Chloride, mg/l)

**Alternative Source Water Quality Analysis:
Before and After Treatment
(Assumes Years: 1983-1990)⁽¹⁾
(Bromide/Bromate, ug/l)⁽²⁾**

Alternative Source	Bromide Before Treatment		Bromate Treatment At Existing EBMUD Facilities ⁽³⁾				Bromate Treat With Ozonation & Post Chloramination				Bromate Pre & Post Chloramination			
	Avg.	Max.	Avg.	Max.	Cancer Risk ⁽⁴⁾	Cost (\$)	Avg.	Max.	Cancer Risk ⁽⁴⁾	Cost (\$)	Avg.	Max.	Cancer Risk ⁽⁴⁾	Cost (\$)
Pardise	16	80	0	6	0	0	0	5	0	7.2	0	0	0	0.2
Camanche	16	80	0	5	0	1	0	5	0	8.2	0	0	0	1.2
Sierra/Delta Res. (5)	76	110	1	6	18	2	5	5	63	9.6	0	0	0	2.3
Delta Only Res. (7)	176	220	3	10	31	5 ⁽⁸⁾	10	10	125	13.0 ⁽⁹⁾	0	0	0	5.5 ⁽⁸⁾
American R. (3)	16	130	0	10	0	1	0	10	0	8.2	0	0	0	1.2
Sacramento R. (10)	16	90	0	5	0	1	0	5	0	8.2	0	0	0	1.2
Delta Blend (11)	66	100	1	10	18	1	5	10	63	8.2	0	0	0	1.2
Ground Water (12)	16	80	0	5	0	2	0	5	0	9.2	0	0	0	2.2
Desalination (13)														

Notes:

- (1) Data Is Averaged with Respect to Time.
- (2) There Is No Current State Or Federal Standard For Bromate.
- (3) Assumes 75% To Direct Filtration; 10% To San Leandro & 15% To San Pablo Reservoir.
- (4) Cancer Incidence Per Million (Lifetime Exposure, 20/day). Annual Cancer Incidence Calculated By Dividing Risk By 70 Years.
- (5) Added Average Cost Millions 1980 \$/325 MGD Capacity.
- (6) Assumes 2:1 Sacramento River/American River Water At 50 mg/L Chloride.
- (7) Assumes Delta Water At 30 mg/L Chloride.

(8) DORR Will Not Allow District's Direct Filtration Plants To Treat 100% Delta Water. Required Treatment Would Add Significantly To The Cost.

(9) Assume Polson South Canal Take-Off.

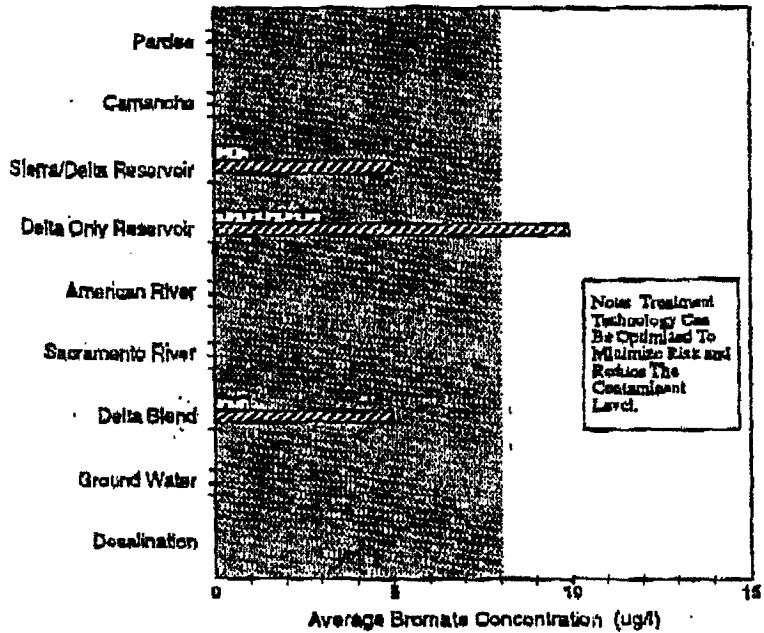
(10) Sacramento River Above Folsom & Below Confluence.

(11) Assumes 1:4 Blend: Delta/Mokelumne/Ground Water (Data From Indian Slough).

(12) Assumes 2:1 Blend: Mokelumne/Ground Water; Data Collected from Municipal Well in Lodi. Arranged with Respect to Time & Location.

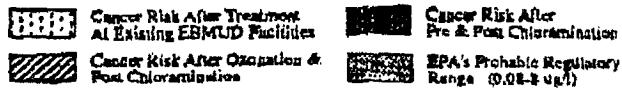
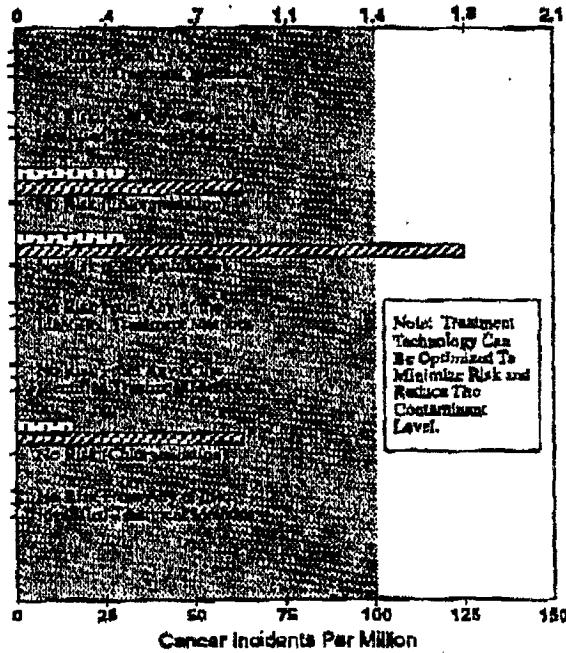
(13) Assume Bayside Is Oakland (After Treatment).

Contaminant Level Comparison



Cancer Risk Comparison

Annual Cancer Incidents



EBMUD UPDATED WSMP EIS/EIR

**Alternative Source Water Quality Analysis:
Before and After Treatment
(Assumes Years: 1983-1990) (1)
(THMFP/THM, ug/l) (2)**

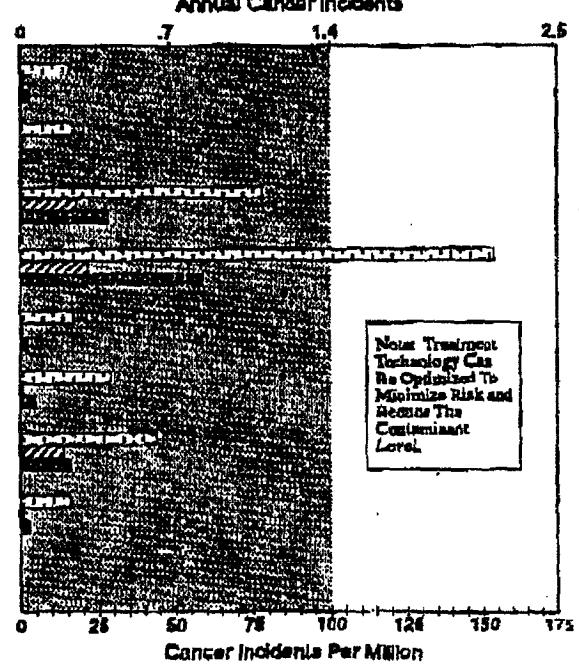
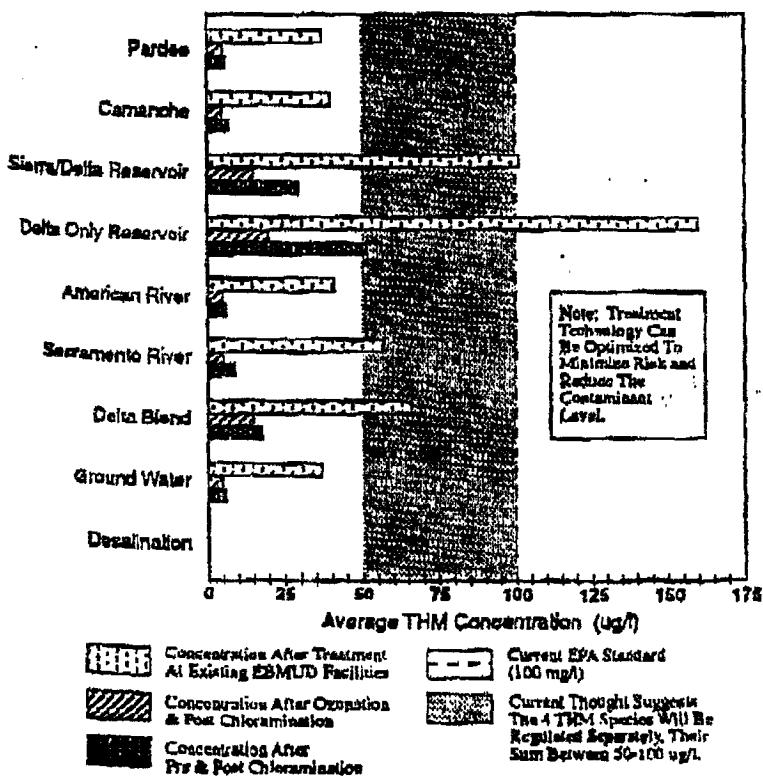
Alternative Source	THMFP Before Treatment		THM Treatment at Existing EBMUD Facilities (3)				THM Treat With Ozonation & Post Chloramination				THM Pre & Post Chloramination			
	Avg.	Max.	Avg.	Max.	Cancer Risk (4)	Cost (\$)	Avg.	Max.	Cancer Risk (4)	Cost (\$)	Avg.	Max.	Cancer Risk (4)	Cost (\$)
Pardise	82	260	37	104	16	0	<5	10	<1	7.2	8	26	3	0.2
Gemarache	67	265	40	108	17	1	<5	10	<1	8.2	7	27	3	1.2
Sierra/Delta Res. (5)	132	300	101	150	78	2	15	30	18	9.6	30	42	29	2.3
Delta Only Res. (7)	202	470	160	320	154	5(8)	20	40	22	13.9(9)	52	104	59	5.5(10)
American R. (9)	58	260	41	100	17	1	<5	10	<1	8.2	8	25	2	1.2
Sacramento R. (10)	62	330	57	184	29	1	<5	20	<1	8.2	9	38	5	1.2
Delta Blend (11)	88	240	66	95	44	1	15	30	14	8.2	18	24	16	1.2
Ground Water (12)	62	260	37	104	16	2	<5	10	<1	8.2	8	26	3	2.2
Desalination (13)														

Notes:

- (1) Data is Averaged with Respect to Time.
- (2) EPA MCL for THM is 100 ug/l.
- (3) Assumes 75% To Direct Filtration: 10% To San Leandro & 15% To San Pablo Reservoirs.
- (4) Cancer Incidents Per Million (Lifetime Exposure, 200 Year). Annual Cancer Incidents Calculated By Dividing Risk By 70 Years.
- (5) Added Annual Cost: Millions 1990 \$/325 MGD Capacity.
- (6) Assumes 2:1 Sierra/Delta Mix: Assumes Delta Water at 50 mg/l Chloride.
- (7) Assumes Delta Water at 50 mg/l Chloride.

- (8) DOBIS Will Not Allow District's Direct Filtration Plants To Treat 100% Delta Water. Required Facilities Would Add Significantly To The Cost.
- (9) Assume Folsom South Canal Take-Out.
- (10) Sacramento River Above Folsom & Below Confluence.
- (11) Assume 1:4 Blend: Delta/Dokodokamee (Water Quality Data At Indian Slough).
- (12) Assume 2:1 Blend: Mokelumne/Coyote Water: Data Collected from Municipal Wells in Stockton, Averaged with Respect to Time & Location.
- (13) Assume Bayside In Oakland (After Treatment).

Contaminant Level Comparison



Alternative Source Water Quality Analysis:
Before and After Treatment
(Assumes Years: 1988-1990)⁽¹⁾
(Taste & Odor, odor units)

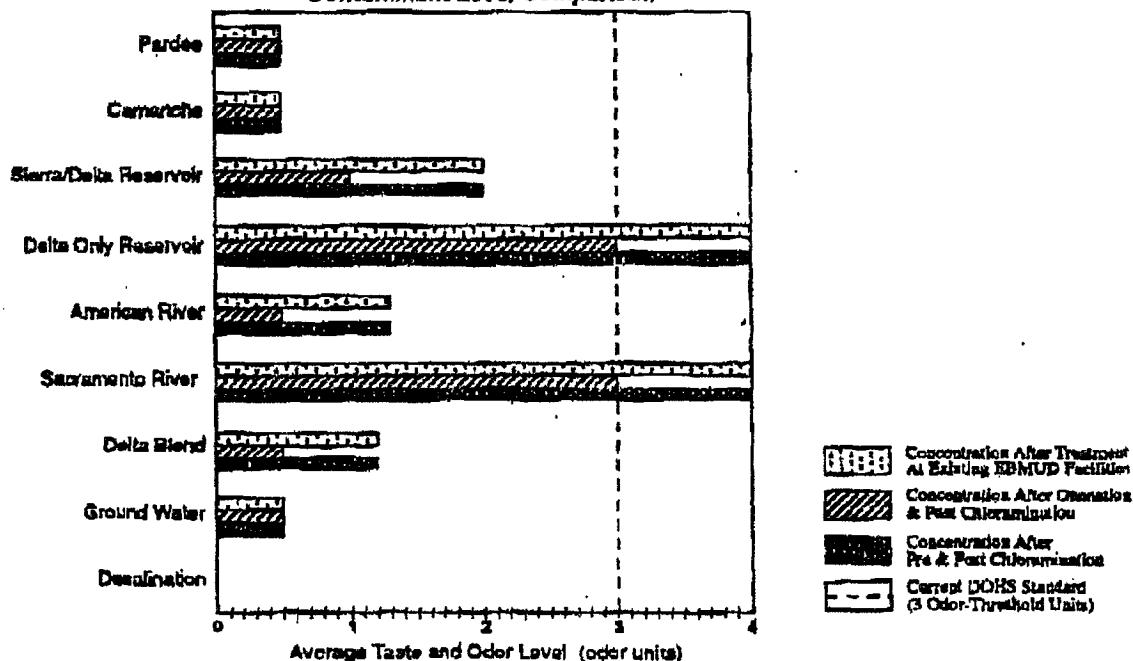
Alternative Source	Treatment At Existing EBMUD Facilities ⁽²⁾				Treat With Ozonation & Post Chloramination				Pre & Post Chloramination			
	Avg.	Max.	Meets Standard (3)	Cost (4)	Avg.	Max.	Meets Standard (3)	Cost (4)	Avg.	Max.	Meets Standard (3)	Cost (4)
Pardise	<1	6	Yes	0	<1	3	Yes	7.2	<1	8	Yes	0.2
Carmenche	<1	8	Yes	1	<1	4	Yes	8.2	<1	5	Yes	1.8
Sierra/Delta Res. (5)	2	7	Yes	2	1	3	Yes	9.6	2	7	Yes	2.9
Delta Only Res. (6)	4	8	No	5(7)	3	4	Yes	13.8(7)	4	8	No	5.5(7)
American R. (8)	1.3	21	Yes	1	<1	8	Yes	8.2	1.3	21	Yes	1.2
Sacramento R. (9)	4	45	No	1	2	10	Yes	8.2	4	45	No	1.2
Delta Blend (10)	1.2	6	Yes	1	<1	4	Yes	8.2	1.2	6	Yes	1.2
Ground Water (11)	<1	8	Yes	2	<1	3	Yes	9.2	<1	8	Yes	2.2
Desalination (12)												

Notes:

- (1) Data is Averaged with Respect to Time.
- (2) Raw Water Is Not Tasted For Taste & Odor; Assumes 75% To Direct Filtration; 10% to San Leandro & 15% To San Pablo Reservoir.
- (3) State Secondary Standard Is 3 Odor Threshold Units.
- (4) Added Annual Cost Millions 1990 \$/325 MGD Capacity.
- (5) Assumes 2:1 Sierra/Delta Mix; Assumes Delta Water at 50 mg/l Chloride.
- (6) Assumes Delta Water at 50 mg/l Chloride.

- (7) DWR Will Not Allow District's Direct Filtration Plants To Treat 100% Delta Water; Required Facilities Would Add Significantly To The Cost.
- (8) Assume Folsom South Canal Take-Out.
- (9) Sacramento River Above Folsom & Below Confluence.
- (10) Assumes 1:4 Blend: Delta/Mokelumne (Data From Indian Slough).
- (11) Assumes 2:1 Blend: Mokelumne/Ground Water; Data Collected from Municipal Wells Is Used, Averaged with Respect to Time & Location.
- (12) Assumes Bayside In Oakland (After Treatment).

Contaminant Level Comparison



~~EBMUD UPDATED WSMF EIS/EIR~~

Alternative Source Water Quality Analysis:
Before Treatment
(Assumes Years: 1983-1990) (1)
(TDS, mg/l)

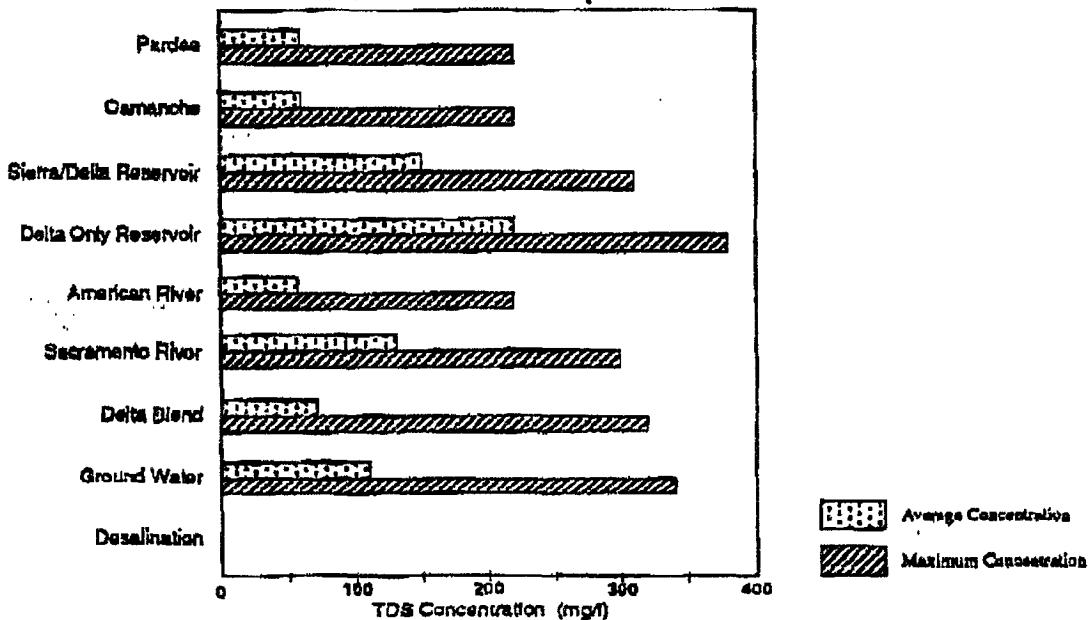
Alternative Source	Before Treatment (2)		
	Average	Maximum	Meets Standard (3)
Pardise	60	220	Yes
Camanche	60	220	Yes
Sierra/Delta Reservoir (4)	150	310	Yes
Delta Only Reservoir (5)	220	360	Yes
American River (6)	57	220	Yes
Sacramento River (7)	130	300	Yes
Delta Blend (8)	70	320	Yes
Ground Water (9)	110	340	Yes
Desalination (10)			

Notes:

- (1) Data is Averaged with Respect to Time.
- (2) There Is No Significant Change After Treatment.
- (3) State Secondary Standard Is 500 mg/l.
- (4) Assumes 2:1 Sierra/Delta Mix; Assumes Delta Water At 50 mg/l Chloride.
- (5) Assumes Delta Water at 50 mg/l Chloride.

- (6) Assume Federal South Canal Take-Off.
- (7) Sacramento River Above Prospect & Below Confluence.
- (8) Assumes 1:4 Blend: Delta/Mokelumne (Data From Indian Slough).
- (9) Assumes 2:1 Blend: Mokelumne/Ground Water; Data Collected from Municipal Wells in Lodi, Averaged with Respect to Time & Location.
- (10) Assumes Bayside In Oakland (After Treatment).

Contaminant Level Comparison



EBMUD UPDATED WSMP EIS/BIR

Alternative Source Water Quality Analysis:
Before and After Treatment
(DBCP, ug/l) (1)

Alternative Source	Before Treatment			Treatment At Existing EBMUD Facilities (2)				Treat With GAC At The Source (3)			
	Avg.	Max.	Avg.	Max.	Cancer Risk (4)	Cost (5)	Avg.	Max.	Cancer Risk (4)	Cost (5)	
Ground Water (6)	0.1	1	0.1	1	50	2	0	0	0	2	

Notes:

- (1) EPA MCL For DBCP Is 0.2 ug/l.
- (2) Assumes 75% To Direct Miletion; 10% To San Leandro & 15% To San Pablo Reservoirs.
- (3) GAC = Granular Activated Carbon.
- (4) Cancer Incidence Per Millions (Lifetime Exposure, 2 lit/day). Annual Cancer Incidence Calculated By Dividing Risk By 70 Years.
- (5) Added Annual Cost Millions 1990 \$50 MGD Capacity.
- (6) DBCP's Have Been Detected In Certain Wells. No Other Sources have Measurable Amounts of DBCP's.
Assumes 2:1 Blend: Mokelumne/Ground Water; Data Collected from Municipal Wells in Lodi, Averaged with Respect to Time & Location.

EBMUD UPDATED WSMP ZIS/EIR

ALTERNATIVE SOURCE RANKING BY CONTAMINANT

TREATMENT AT EXISTING EBMUD FACILITIES

(Assumes Years: 1983-1990)

	THM	Bromate	Chloride	TDS	Taste & Odor
Higher Quality	Pardoe Ground Water Camarache	Pardoe Camarache American River Sacramento River Ground Water	Pardoe Camarache American River Ground Water	American River Pardoe Camarache	Pardoe Camarache Ground Water
	American River	Sierra/Delta Reservoir	Sacramento River	Delta Blend	Delta Blend
	Sacramento River	Delta Blend	Delta Blend	Ground Water	American River
	Delta Blend	Delta Blend	Sierra/Delta Reservoir	Sacramento River	Sierra/Delta Reservoir
	Sierra/Delta Reservoir	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir
	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir	Sacramento River

EBMUD UPDATED WSMP EIS/EIR

ALTERNATIVE SOURCE RANKING BY CONTAMINANT
OZONATION & POST CHLORAMINATION
(Assumes Years: 1983-1990)

	THM	Bromate	Chloride	TDS	Taste & Odor
Higher Quality	Pardise Ground Water	Pardise Camanche American River Sacramento River Ground Water	Pardise Camanche American River Ground Water	American River Pardise Camanche	Pardise Camanche American River Delta Blend Ground Water
	Camanche				
	American River	Sierra/Delta Reservoir	Sacramento River	Delta Blend	
	Sacramento River			Ground Water	Sierra Delta Reservoir
	Delta Blend	Delta Blend	Delta Blend	Sacramento River	
	Sierra/Delta Reservoir		Sierra/Delta Reservoir	Sierra/Delta Reservoir	
	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir	Delta Only Reservoir Sacramento River

EBMUD UPDATED WSMP EIS/EIR

ALTERNATIVE SOURCE RANKING BY CONTAMINANT

PRE & POST CHLORAMINATION
(Assumes Years: 1983-1990)

	THM	Bromate	Chloride	TDS	Taste & Odor
Higher Quality	Pardise American River Ground Water	Pardise Camarache Sierra/Delta Reservoir Delta Only Reservoir American River Sacramento River Delta Blend Ground Water	Pardise Camarache American River Ground Water	American River Pardise Camarache	Pardise Camarache Ground Water
	Camarache			Delta Blend	Delta Blend
	Sacramento River		Sacramento River	Ground Water	American River
	Delta Blend		Delta Blend	Sacramento River	Sierra/Delta Reservoir
	Sierra/Delta Reservoir		Sierra/Delta Reservoir	Sierra/Delta Reservoir	Delta Only Reservoir
	Delta Only Reservoir		Delta Only Reservoir	Delta Only Reservoir	Sacramento River

EBMUD UPDATED WSMP 618/EIR

ALTERNATIVE SOURCE WATER QUALITY ANALYSIS
RELATIVE CANCER RISK COMPARISON
(Averaged From 1983-1990 Data)

